

# Fast Solar Sailing for Solar System Exploration

Completed Technology Project (2013 - 2015)



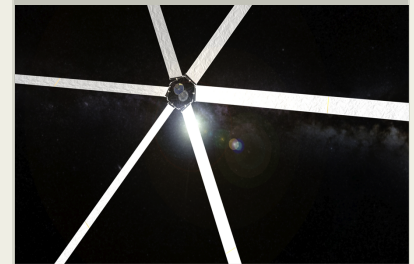
## Project Introduction

Practical spinning solar sails will be needed for the most demanding and scientifically compelling solar sail missions of the future. The "heliogyro" is potentially the most feasible high-performance spinning architecture, although technology readiness is very low and deployment and flight dynamics are impossible to validate on the ground. A pathway towards an affordable flight demonstration of a practical heliogyro spinning solar sail will be required to realize the full potential of solar sailing for solar system exploration and science missions.

The "HELIOS" heliogyro solar sail concept, developed as part of this project, has a theoretical characteristic acceleration performance 5 to 10 times that achievable with current in-space propulsion technologies. This is sufficient to provide a lower-cost alternative to long-duration solar electric propulsion missions. Missions where practical, heliogyro solar sail technology would be enabling or significantly enhancing include space weather solar storm early warning sentinels, multiple-NEO rendezvous human exploration precursor missions, pole sitters for terrestrial and lunar communications relays, Earth-Mars cargo conveyors for supply prepositioning, and asteroid deflection missions. These "fast" heliogyro solar sails would also enable many space science missions that are impossible to perform with chemical or electric propulsion. These include high-inclination solar polar imaging spacecraft, inner solar system sun-synchronous orbiters, Kuiper belt fly-throughs, and interstellar probes.

## Anticipated Benefits

N/A



Project Image Fast Solar Sailing for Solar System Exploration

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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Langley Research Center (LaRC)

### Responsible Program:

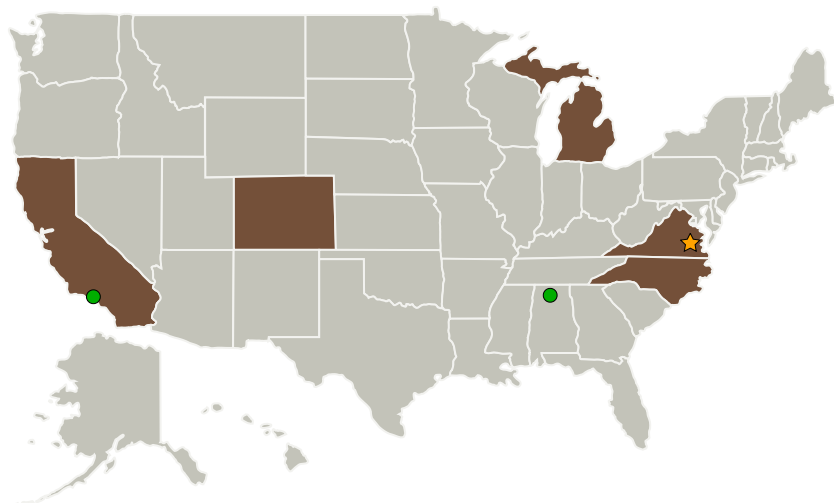
Center Innovation Fund: LaRC CIF

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★ Langley Research Center(LaRC)	Lead Organization	NASA Center	Hampton, Virginia
● Jet Propulsion Laboratory(JPL)	Supporting Organization	NASA Center	Pasadena, California
● Marshall Space Flight Center(MSFC)	Supporting Organization	NASA Center	Huntsville, Alabama

## Project Management

**Program Director:**

Michael R Lapointe

**Program Manager:**

Julie A Williams-byrd

**Project Manager:**

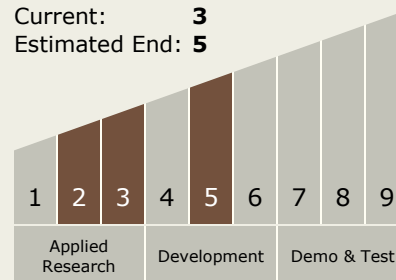
William K Wilkie

**Principal Investigator:**

William K Wilkie

## Technology Maturity (TRL)

Start: 2  
Current: 3  
Estimated End: 5



## Technology Areas

**Primary:**

- TX01 Propulsion Systems
  - TX01.4 Advanced Propulsion
    - TX01.4.1 Solar Sails

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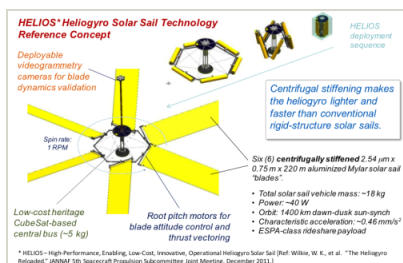


Co-Funding Partners	Type	Location
Duke University	Academia	Durham, North Carolina
Jet Propulsion Laboratory(JPL)	NASA Center	Pasadena, California
Marshall Space Flight Center(MSFC)	NASA Center	Huntsville, Alabama
University of Colorado Boulder	Academia	Boulder, Colorado
University of Michigan-Ann Arbor	Academia	Ann Arbor, Michigan

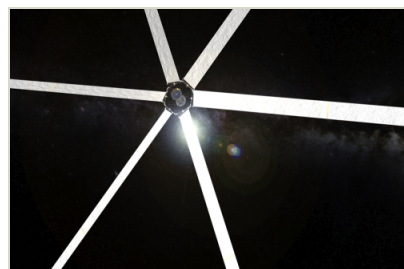
## Primary U.S. Work Locations

California	Colorado
Michigan	North Carolina
Virginia	

## Images

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Project Image Fast Solar Sailing for Solar System Exploration  
 (<https://techport.nasa.gov/image/2293>)

**12034-1378761716128.jpg**

Project Image Fast Solar Sailing for Solar System Exploration  
 (<https://techport.nasa.gov/image/2294>)